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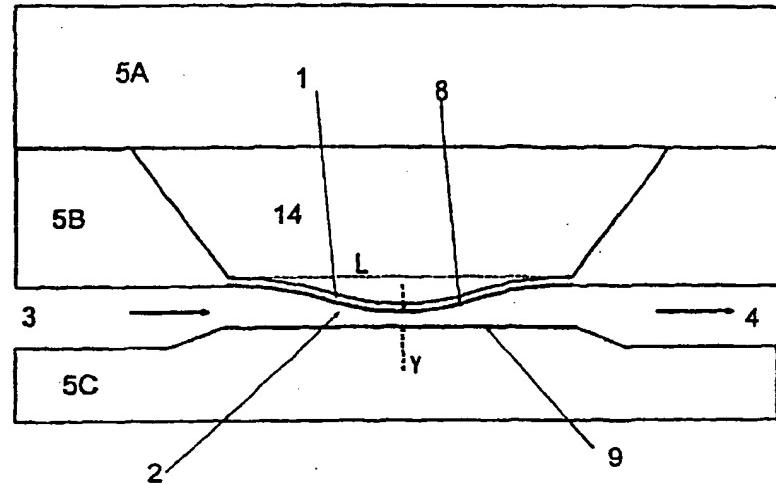
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[Continued on next page]

(54) Title: MEMS PILOT VALVE



(57) Abstract: Valve, for e.g. a pilot valve in an IP regulator, realised for example in a MEMS-structure, comprising a fluid inlet (3) and a fluid outlet (4) coupled by a fluid channel (2), all of which are defined by walls and structures (5) produced by micromachining of glass and/or silicon. An actuator (1, 8, 9) can be set to at least two different positions in order to vary the flow cross section of the fluid channel (2). The geometries of the fluid inlet, outlet and channel are adapted for preventing the flow from changing its direction so sharply that a significant portion of contaminating droplets and/or particles in the flow hit the walls of structures, as given in any arrangement according to or between the following two extremes: i) flow outlet is perpendicular to the flow inlet and the outlet dimension is larger than a critical dimension, L_{crit} estimated according to a given formula and/or as simulated in a CFD-tool (Computational Fluid Dynamics), and ii) flow outlet and flow channel is generally parallel to flow inlet giving a substantially unidirectional flow pattern.

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INTERNATIONAL SEARCH REPORT

1

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A. CLASSIFICATION OF SUBJECT MATTER

IPC7: F16K 31/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 0233268 A2 (RESEARCH FOUNDATION OF STATE UNIVERSITY OF NEW YORK), 25 April 2002 (25.04.02) --	
A	US 6345502 B1 (TAI ET AL), 12 February 2002 (12.02.02) --	
A	US 6527003 B1 (WEBSTER), 4 March 2003 (04.03.03) --	
A	US 6557820 B2 (WETZEL ET AL), 6 May 2003 (06.05.03) -----	

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Information on patent family members

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Patent document cited in search report		Publication date		Patent family member(s)		Publication date
WO	0233268	A2	25/04/02	AU	1340002 A	29/04/02
				US	6592098 B	15/07/03
				US	2002043638 A	18/04/02
US	6345502	B1	12/02/02	US	6499297 B	31/12/02
				US	6536213 B	25/03/03
				US	2001014438 A	16/08/01
				US	2001017287 A	30/08/01
				US	2002062645 A	30/05/02
				AU	1522299 A	31/05/99
				WO	9924744 A	20/05/99
				US	6146543 A	14/11/00
US	6527003	B1	04/03/03	NONE		
US	6557820	B2	06/05/03	US	2002175302 A	28/11/02